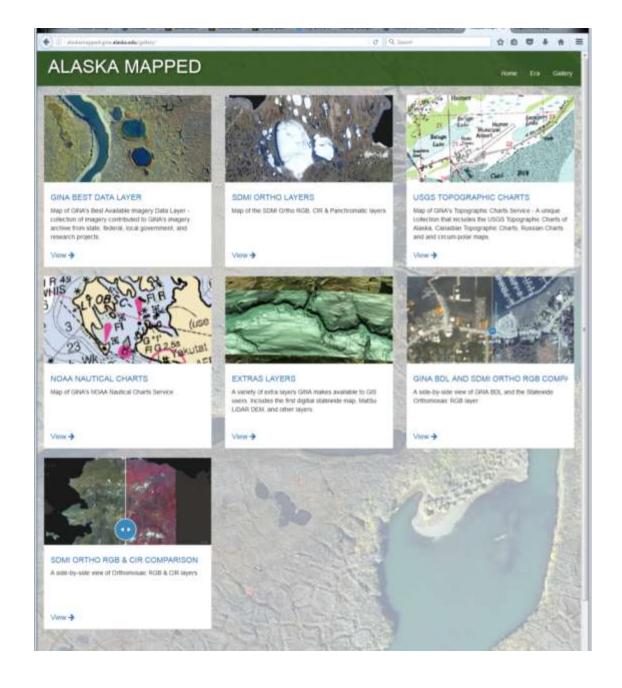# Imagery Services

- GeoNorth will be hosting imagery services starting March 2017

- Web mapping services will be available on a subscription basis from wms.alaskamapped.org
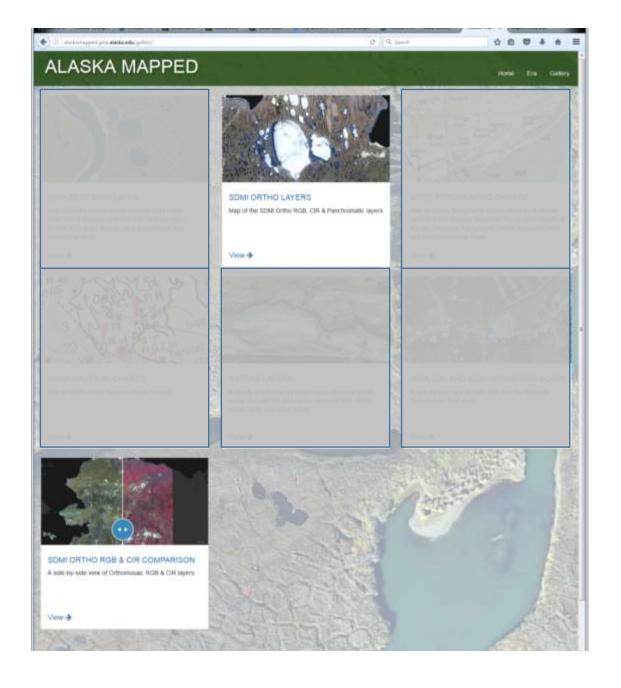
CHANGE AHEAD

(Don't panic)

Imagery Services

- 24-month contract with GeoNorth Feb. 17, 2017-Feb. 16, 2019
- $279,589 billed monthly at $11,649.54/mo
- What is included:
  - Imagery storage, hosting, and backup (up to 10 terabytes)
  - Additional datasets can be added for $125 per month per terabyte
  - Support services
  - Pricing options for additional items:
    - WorldDEM elevation products, 12-meter resolution ($9.20/km2 - $21.90/km2)
    - Pleiades 50-cm resolution satellite imagery ($8.12/km2 - $13.72/km2)
    - SPOT 1.5-meter satellite imagery ($3.08/km2 - $3.71/km2)
    - SPOT processing $4.98/km2, purchased in 20km x 20km blocks ($1,992/tile)

Imagery Services

- Currently offered through GINA but NOT included:
  - NASA Blue Marble low-res (250-meter) imagery mosaic
  - Landsat 1988-1992 mid-res (15-meter) imagery mosaic
  - Best data layer 'bdl' high-res (1-25 meter) imagery mosaic including datasets from Digital Globe, USDA-NRCS, USDA-FS, USGS, BLM, NPS, FAA, Alaska DNR, DMVA, ~~DCED~~, DOT&PF
  - USGS digital raster grid (DRG) topos, 1:24,000; 1:25,000; 1:63:360, 1:250,000
  - Canadian Topographic Maps
  - Shaded relief NED
  - Landsat 15-meter panchromatic and pseudo-natural color
  - NOAA Raster Nautical Charts, FAA charts, and many other datasets
  - Web Coverage Service Elevation Datasets: ASTER DEM, SRTM Version 2, Katalia, NED 1/3 and 2 Arc Second, Chugach SPOT DEM, Kenai LiDAR
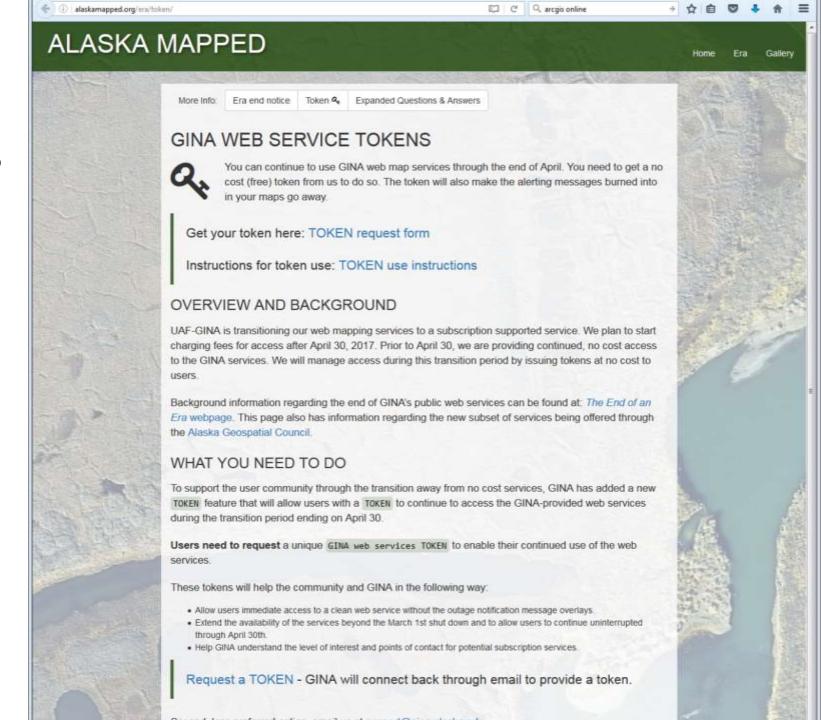
Imagery Services

- The contract with GeoNorth will initially include only the SDMI SPOT datasets and the Dept. of Community and Economic Development's community aerial photography.
  - (~5TB, uncached). Anticipating 6 caches at 9-20GB/cache
- Additional datasets will need to be re-aggregated from agency partners: USDA-NRCS, USDA-FS, USGS, BLM, NPS, FAA, Alaska DNR, DMVA, ~~DCED~~, DOT&PF

UAF-GINA Tokens

Get TODAY for access through Apr. 30:

http://alaskamapped.org/era/token/

Ok, but THEN where and how will I get Imagery??

Some Available Imagery Sources:

- http://gisgeography.com/free-satellite-imagery-data-list/
- US Geologic Survey Earth Explorer: https://earthexplorer.usgs.gov/
- National Map: https://nationalmap.gov/
  - Service endpoints: https://viewer.nationalmap.gov/services/
- European Space Association
  - Sentinel mission: https://scihub.copernicus.eu/dhus/#/home
  - Earth Online: https://earth.esa.int/web/guest/eoli
- NOAA:
  - http://www.class.noaa.gov/
  - https://coast.noaa.gov/dataviewer/
- NASA: https://reverb.echo.nasa.gov/
- Polar Geospatial Center: http://www.pgc.umn.edu/imagery/satellite
- ESRI World imagery:
  - https://services.arcgisonline.com/ArcGIS/rest/services/World_Imagery/MapServer

Some useful definitions:

- Georeference:
  - the process of projecting and thereby assigning coordinates (e.g. latitude and longitude) to an image. A georeferenced image has no accuracy guarantee; and while often times there is an accuracy statement for this type of data, it is a global average and not an assurance. In order to assure the horizontal accuracy of an image, it needs to be orthorectified.

- Orthorectify:
  - the process of removing internal and external distortions to assign more accurate coordinates to the final image

- Pansharpening:
  - the process of merging high-resolution panchromatic and lower resolution multispectral imagery to create a single high-resolution color image

Comparing High- and Medium-Resolution Commercial Imaging Satellites

Satellite	Launch Date	Swath Width (kilometers) [1]	Native GSD (meters)[2]	Output Resolution (meters)	Max View Scale[3]	Native Accuracy (meters)[4]	Bands	Bit Depth	Stereo
IKONOS	Sept. 24, 1999	11.3	0.82 x 3.20	1 x 4 [5]	1:2,500	15	pan + 4 MS	11	yes
QuickBird	Oct. 18, 2001	18[6]	0.65 x 2.62	0.6 x 2.4	1:1,500	23	pan + 4 MS	11	no
SPOT-5	May 3, 2002	60	5 x 10 x 20	2.5 x 5 x 10 x 20[7]	1:5,000	48	pan + 4 MS	8	yes
WorldView-1	Sept. 18, 2007	17.7	0.5	0.5	1:1,250	5	pan only	11	yes
RapidEye	Aug. 29, 2008	77	6.5	5	1:12,500	23- 45[8]	5 MS (no pan)	12	no
GeoEye-1	Sept. 6, 2008	15.2	0.41 x 1.65	0.5 x 2	1:1,250	5	pan + 4 MS	11	yes
WorldView-2	Oct. 8, 2009	17.7	0.46 x 1.85	0.5 x 2	1:1,250	5	pan + 8 MS	11	yes
Pléiades 1	Dec. 16, 2011	20	0.70 x 2.4	0.5 x 2	1:1,250	to be determined	pan + 4 MS	12	yes

[1] at nadir

[2] at nadir

[3] Estimated value only, as actual max zoom level prior to pixelization will vary based on collection geometry and size, shape and contrast of objects on ground. (If satellite offers multiple resolutions, the max zoom value listed is for the highest available resolution.)

[4] Horizontal accuracy CE90 without GCPs (except Rapid Eye), excluding terrain and off-nadir effects

[5] Higher elevation angle imagery available at 0.80 meter x 3.20 meters

[6] Changed from earlier 16.5 kilometers due to April 2011 orbit raise

[7] 2.5 meters from 2 x 5-meter scenes

[8] RapidEye is the only imagery listed where GCPs (but not a DEM) are used with the Basic (1B) imagery, therefore accuracy is higher in areas where higher accuracy GCPs are available, such as the United States.

SPOT Satellite Imagery

SPOT 5 2007-2013

SPOT 6 & 7 2013-2016

SPOT 5 orthorectified satellite imagery

- 4-band multispectral:
  - red (10-meter),
  - green (10 –meter),
  - near infrared (10-meter),
  - short wave infrared (20-meter),
  - 2.5-meter panchromatic
- Psuedo-natural color
- Panchromatic (grayscale)
- Color-infared
- Meets 1:24,000 National Map Accuracy Standards:
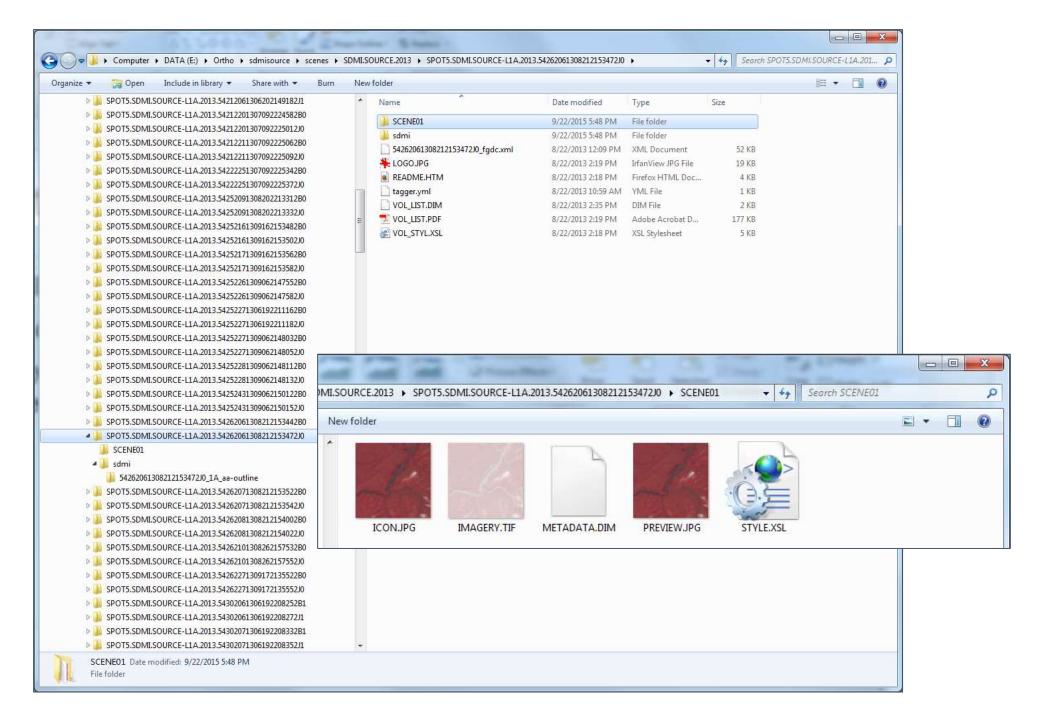 - Points are within 12 meters of their true location at least 90% of the time

2016 SPOT 6 & 7 updates

- 122,000 sq. kilometers of updated ortho tiles
- 4-band multispectral:
  - red (6-meter),
  - green (6 –meter),
  - Blue (6-meter),
  - near infrared (6-meter),
  - 1.5-meter panchromatic
- Psuedo-natural color
- Panchromatic (grayscale)
- Color-infared
- Meets 1:24,000 National Map Accuracy Standards:
  - Points are within 12 meters of their true location at least 90% of the time
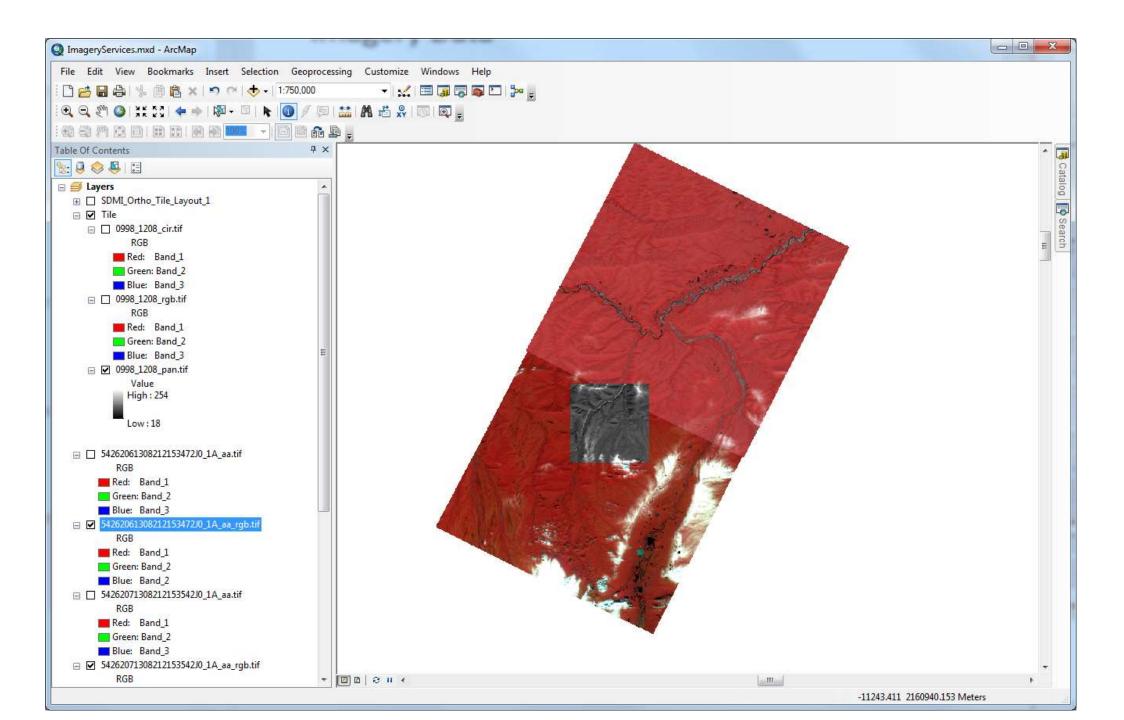
Satellite imagery: steps from scene to mosaic

1. Satellites acquire raw imagery scenes using optical sensors.

2. Collected scenes are downloaded and checked for file corruption.

3. Best available digital elevation model is compiled and projected in the correct coordinate system.

4. Scenes are seamed together and ground control points added (aerotriangulation).

5. Scenes are ortho-rectified using results from step 4 and the digital elevation model from step 3.

6. Pansharpening of 10-meter natural color and colorinfrared composites using 2.5-meter panchromatic band is done.

7. Color corrections are done image by image to ensure land form detail is preserved in highlight and shadow areas, then are done globally.

8. Seamlines are adjusted to avoid buildings, bridges, elevated roadways, or other features .

9. Ortho-image tiles are produced and geo-referenced to the Alaskan Albers projection NAD83(CORS96) (Epoch 2003.00) datum, in meters.

10. Projected tiles are checked for edge-matching so there are no offsets, overlaps or gaps in the final mosaic.

11. Surveyed control points are measured on the final orthoimage tiles to determine the absolute accuracy.

12. Grayscale tiles are created from color composites, and high-magnification visual checks for artifacts or other quality concerns are performed.

13. Tiles are delivered to SDMI co-registered in uncompressed GeoTIFF format and include: 24 bit simulated natural color, 24 bit false color-infrared, and 8 bit panchromatic (black and white). The following production block files are also supplied with the orthoimagery tiles: AT Report in PDF format, AT block boundary in ESRI shapefile format, cutlines in ESRI shapefile format, QC Master in PDF format, scene boundaries in ESRI shapefile format, and tile layout in ESRI shapefile format.
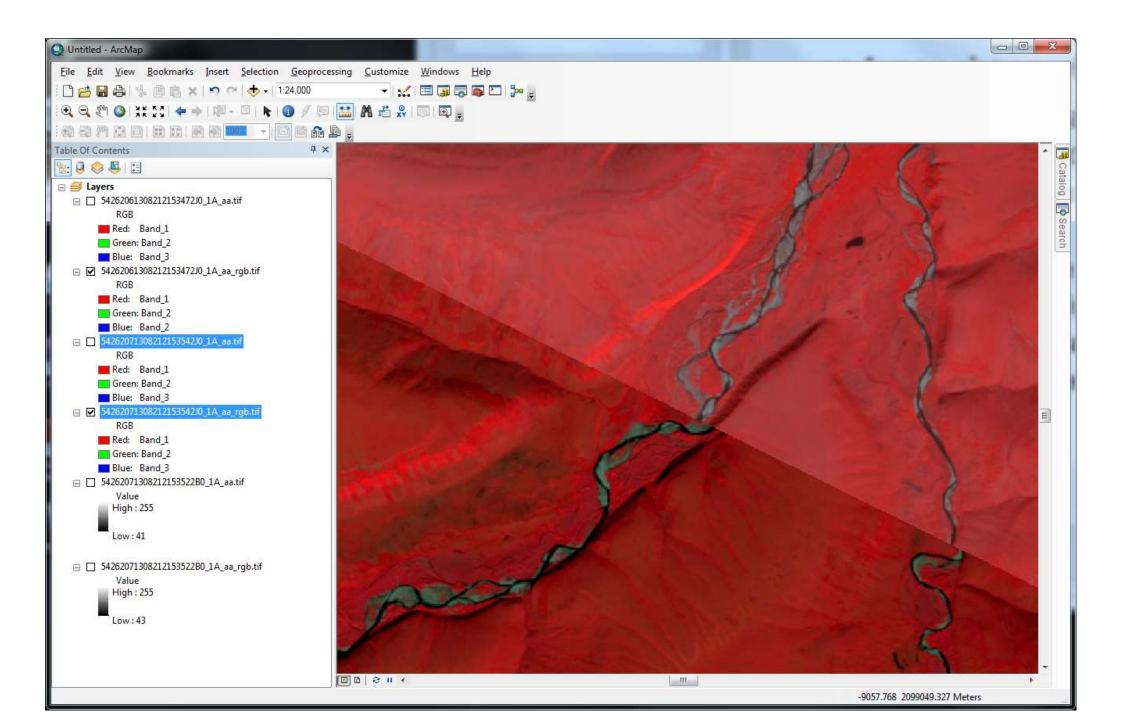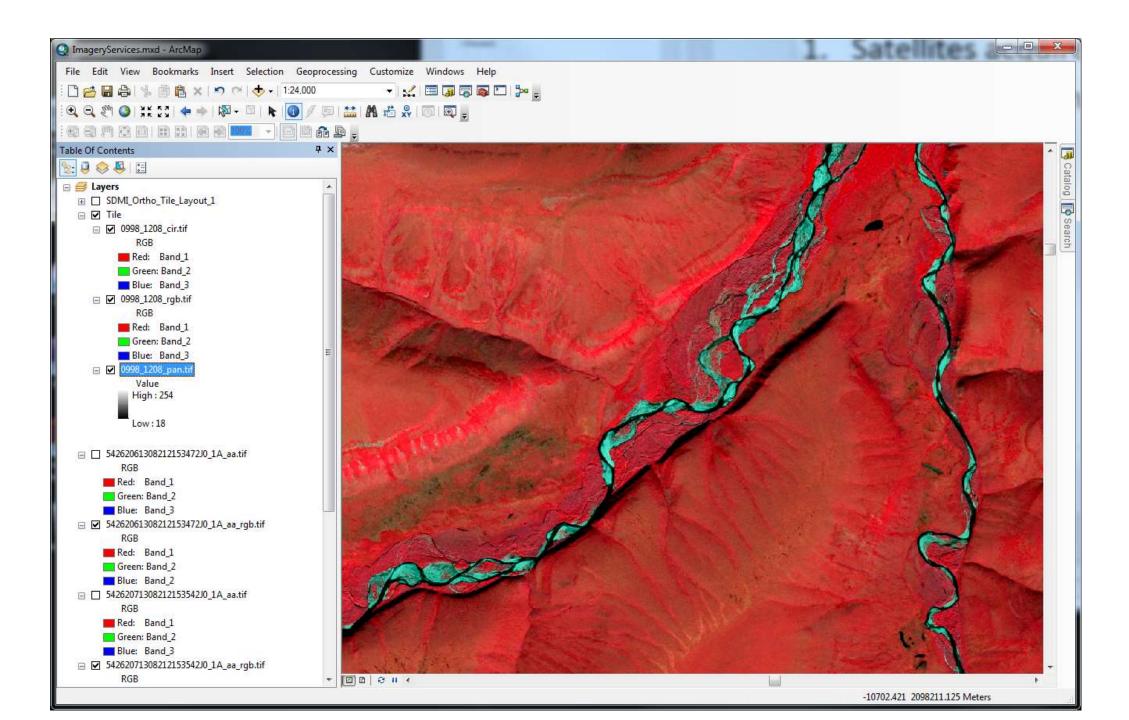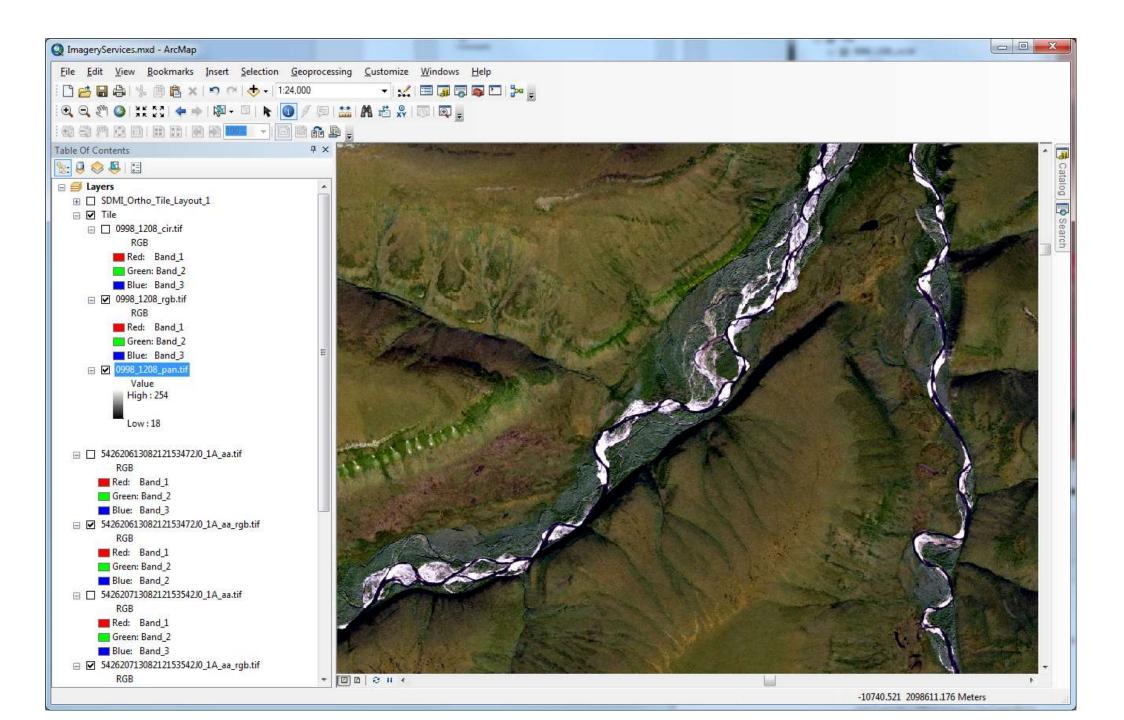
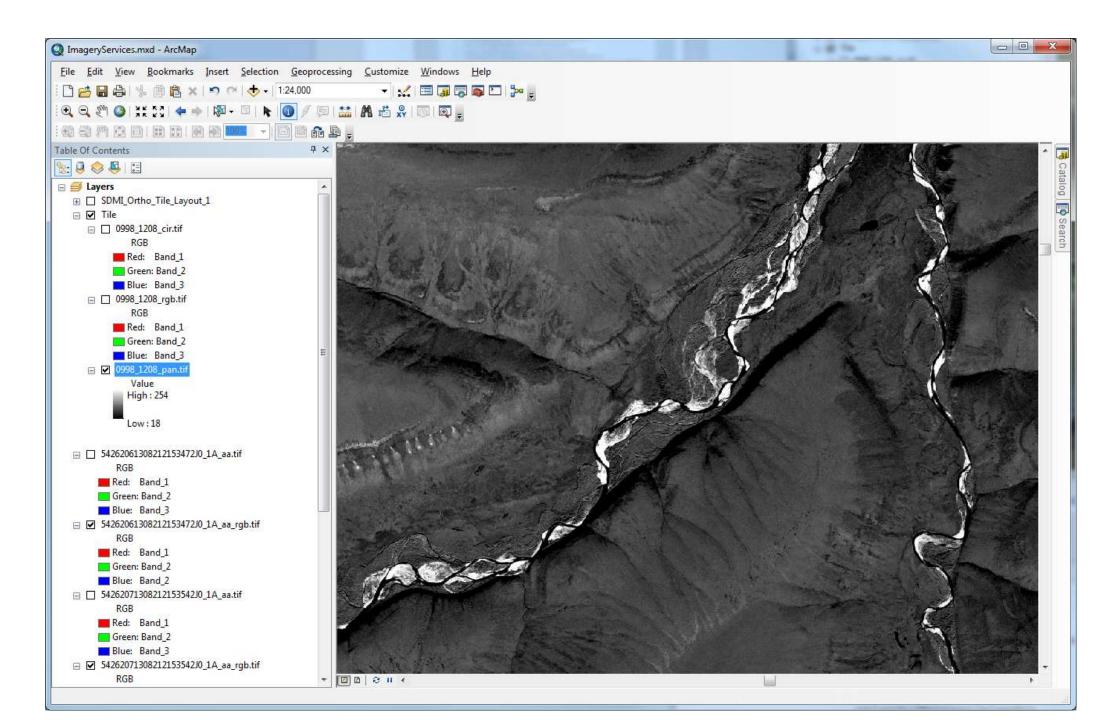# Lots of data

- L1A Source Scenes:
  - 1,834 scenes (917 pairs)

- Ortho Tiles:
  - 4,450+ tiles for each dataset: RGB, PAN, CIR.

Sources for imagery:

Use this?	Try this:
NASA Blue Marble low-res (250-meter) imagery	Blue Marble: Next Generation http://neowms.sci.gsfc.nasa.gov/wms/wms?
Landsat 1988-1992 mid-res (15-meter) imagery mosaic	https://modis.arcgis.com/arcgis/rest/services/ OR https://landsat2.arcgis.com/arcgis/rest/services/
Best data layer 'bdl' high-res (1-25 meter) imagery mosaic	ESRI imagery world 2D https://services.arcgisonline.com/ArcGIS/services SPOT 5 http://agc.dnr.alaska.gov/arcgis/rest/services/SDMI_imgsrv http://forestrymaps.alaska.gov/arcgis/services USGS Imagery https://basemap.nationalmap.gov/arcgis/rest/services/

Adding ArcGIS and Web Mapping Services (WMS) to ArcMap

Demo

Or add layers from [\\dnr-atwfs0.soa.alaska.gov\gis\DNR Technical Working Group\WMS_layer_files\](\\dnr-atwfs0.soa.alaska.gov\gis\DNR Technical Working Group\WMS_layer_files\)

Topographic Maps, Charts, etc

Topographic Maps (DRG's):

The Division of Forestry in Fairbanks offers 1:63,360 and 1:250,000 USGS topographic maps (Digital Raster Grids, DRG's) and hillshades at:

http://forestrymaps.alaska.gov/arcgis/rest/services/Rasters

The new 1:25,000 UStopo information, including updated contour lines, will be incorporated into the USGS service feed on an annual basis and will be available for Alaska (June 2017 estimate) where new USGS topographic maps have been updated through this feed:

https://basemap.nationalmap.gov/arcgis/rest/services/USGSTopo/MapServer

NOAA Nautical Charts:

NOAA nautical charts are available from NOAA as a tiled map service at:

http://tileservice.charts.noaa.gov/

Questions?

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